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Electronic Supporting Information

Dispersion of graphene in ethanol using a simple solvent exchange method

Xiaoyan Zhang, Anthony C. Coleman, Nathalie Katsonis, Wesley R. Browne,* Bart J. van Wees* and Ben L. Feringa*

1. Experimental

Chemicals. Graphite flakes (Sigma-Aldrich), N-methyl-2-pyrrolidone (NMP, Acros Organics, 99%, extra pure), ethanol (absolute, AR, Merck), methanol (99.8%, AR, Lab-Scan), dichloromethane (99.8%, AR, Lab-Scan) and toluene (99.5%, AR, Lab-Scan) were used as received without further purification.

Instruments. Sonication was conducted using a low power sonication bath (Bransonic, PC 620). Centrifugation was performed on a Hermle Z323K Centrifuge. Filtration was carried out using a Sintered Micro Filter holder through a 0.45 μm polytetrafluoroethylene (PTFE) membrane. UV spectra were obtained on a JASCO V-630 UV/Vis spectrometer. Transmission electron microscopy (TEM) characterization was undertaken on a PHILIPS CM10 operating at 100 KV. A drop of graphene in ethanol was deposited on a holey carbon grid. Atomic force microscopy (AFM) was obtained with a PicoScan LE (Molecular Imaging) in tapping mode. The sample was prepared by drop casting a few drops of the graphene dispersion in ethanol onto a hot freshly cleaved mica surface (The mica was contained in a glass petri dish, which was placed in a hot oven at 90 °C). Raman spectra were measured on a JOBIN-YVON model T 64000 triple grating spectrometer (excitation at 532 nm). Fourier Transform Infrared Spectroscopy (FTIR) were collected using a Perkin Elmer spectrophotometer equipped with a UATR attachment. Conductivity measurement was determined using the standard four-point probe method on a Keithley 2410 Source Meter.

2. Determination of residual NMP content for graphene in ethanol

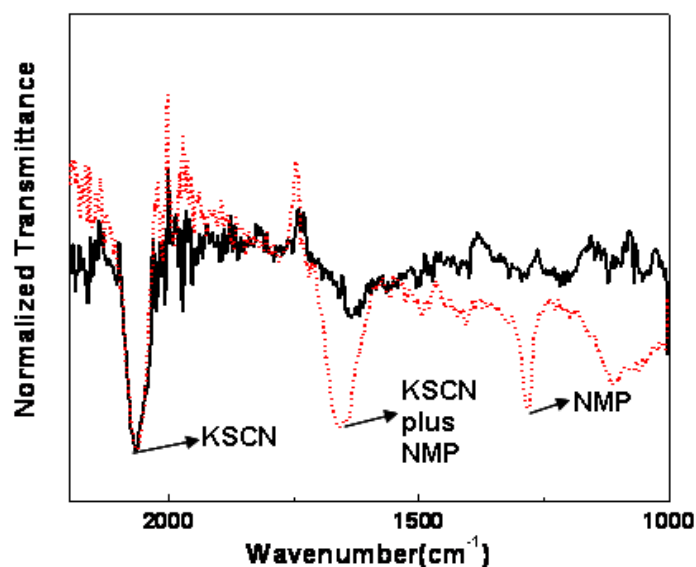


Fig S1. FTIR spectrum of graphene in ethanol with 0.5% KSCN (solid line), and ethanol with 0.5% KSCN plus 0.3% NMP (dotted line). The contents of KSCN and NMP are expressed in vol%. KSCN was used as a reference, and the volume content of KSCN in the two samples are identical. The spectra were obtained by dropping a certain volume (5 μ l) of the two samples on the FTIR crystal plate, followed by 128 scans after the evaporation of ethanol. The spectrum of ethanol with 0.5% KSCN plus 0.3% NMP shows a stronger NMP signal than graphene in ethanol containing 0.5% KSCN, which indicates that the content of NMP should be below 0.3% volume for the sample of graphene in ethanol.

3. Additional TEM images of graphene obtained in ethanol

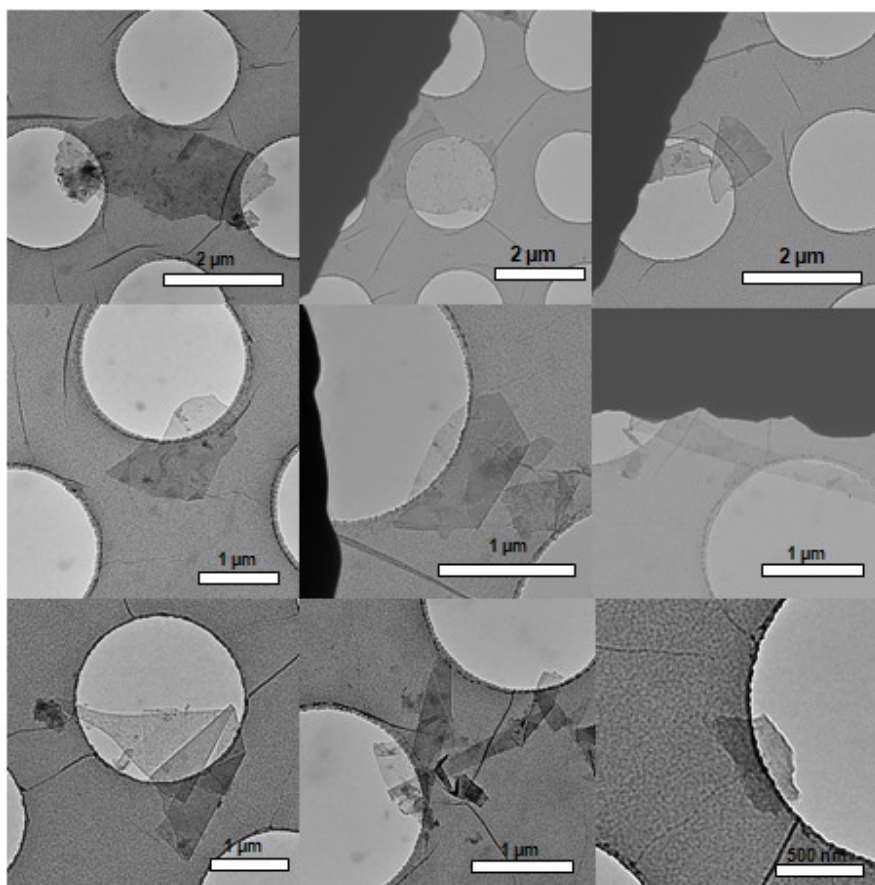


Fig S2. TEM images of graphene in ethanol.

4. FTIR spectrum of graphene from ethanol

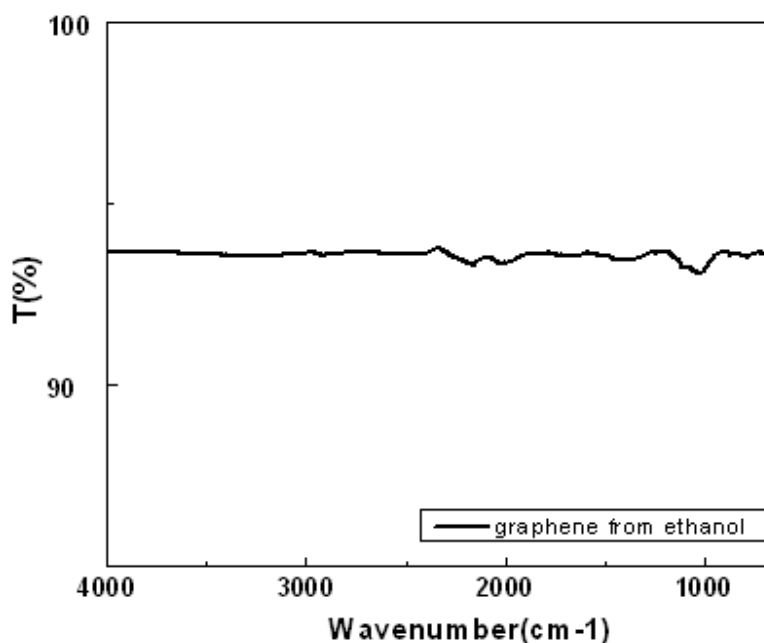


Fig S3. FTIR spectrum of graphene from ethanol. The spectrum is almost featureless, confirming the low content of defects in the graphene sample.

5. Result of solvent exchange using methanol, dichloromethane and toluene.

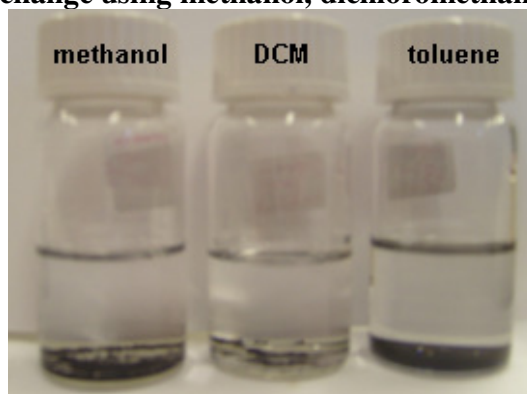


Fig S4. The solvent exchange process described for ethanol was applied using methanol, dichloromethane and toluene also. Graphene was found to completely precipitate after the final centrifugation process (1000 rpm/30 min) in each of these three solvents.